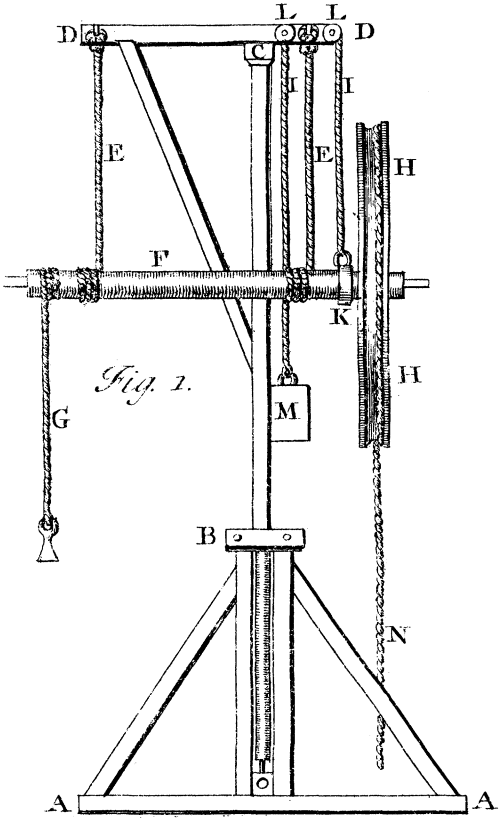

Fig. 1.

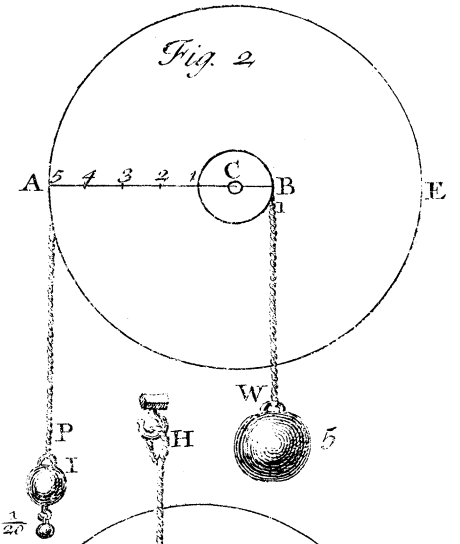

Fig. 2.

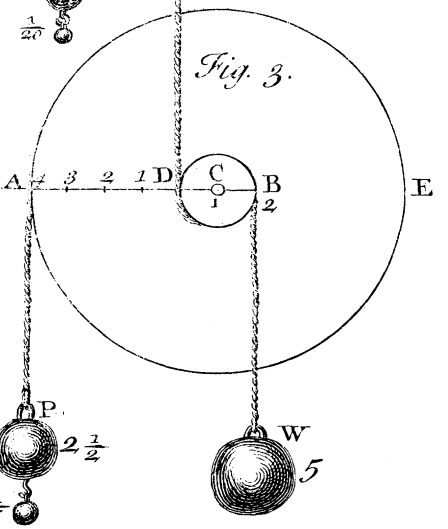

Fig. 3.

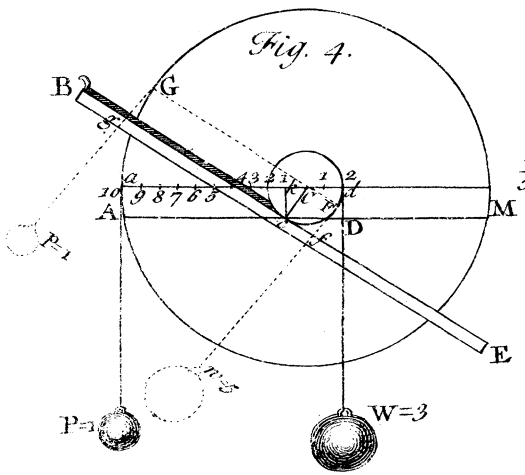

Fig. 4.

342. Sclarea, folio Salviæ, minor, ſive glabra. T. Inſt. 180.
343. Sclarea, folio triangulari; caule tomentoſo. Ib.
344. Tribulus terreſtris. J. B. 2. 352.
345. Tribulus terreſtris, hexaphyllos, Americanus. *An Tribulus terreſtris major; flore maximo, odorato. Sloan. Hiſt. Vol. I. p. 209. Tab. 132. Fig. 1?*
346. Trifolium, anguſtifolium ſpicatum. J. B. 2. 376.
347. Trifolium arvenſe, humile, ſpicatum ſive Lagopus. C. B. 328. foliis latioribus. *Lagopodium Lagopus. Tab. Icon. 524.*
348. Trifolium, Lagopus dictum, anguſtioribus foliis. *Lagopus Lob. Icon. 39.*
349. Trifolium pratenſe, hirſutum, majus; flore albo Sulphureo. Raii Syn. Ed. 2. 193.
350. Trifolium pratenſe, folliculatum. C. B. 329.

II. *An Examination of Monſieur* Perault's *new-invented* Axis in Peritrochio, *ſaid to be entirely void of Friction: With an Experiment to confirm the Reaſoning made upon an* Axis in Peritrochio *firſt us'd in Monſ.* Perault's *Manner, then in the common Way, by* J. T. Deſaguliers, *L L. D.*

AS the Recommendation and Contrivance of a Perſon, who is conſiderable in mechanical Performances, is a great Inducement for others to make uſe of

of a new Machine, which he affirms to have anſwer'd, in Practice, beyond any other us'd for the ſame Purpoſe; ſo I thought it wou'd be an Advantage to thoſe who have Occaſion for Machines, to ſhew the Imperfection of ſuch an Engine, when the Author of it has been miſtaken; thereby to prevent needleſs Expence and Diſappointment, in erecting and trying ſuch kind of Machines.

Monſieur *Perault*'s Account of his Engine is as follows: " In Imitation of the (modern) Crane, " I have invented two Engines for raiſing Weights. " The firſt is made of that Organ which is the moſt ad- " vantageous of any in Mechanicks, for facilitating Mo- " tion; becauſe it is free from that Inconveniency which " we meet with in all others; namely, the Friction " of the Parts of the Machine, which renders their " Motion more difficult. This Organ is the Roller, " which *Ariſtotle* prefers to all other Organs, be- " cauſe all the others, as Wheels, Capſtanes, and Pul- " lies, muſt neceſſarily rub in ſome of their Parts. " But the Difficulty was to apply the Roller to an " Engine that raiſes Weights, its Uſe having only " been hitherto to cauſe them to roll on an horizon- " tal Plane. The Engine which I propoſe has a Baſe " A A B, (Plate I. Fig. 1.) ſomething like the Crane: " This Baſe has in its upper Part the horizontal Pieces " B, which claſps an upright Shaft C O, ſupported un- " der its Pivot C, on which the whole Engine moves in " the ſame manner as the Crane, when the Weight is to " be lower'd. This Shaft ſupports on its Top a croſs " Piece D D, to which are faſten'd the Ropes E E, " which wrap round the Barrel, Axel, or Roller F, " which has another Rope G, that alſo wraps or winds

" round

" round one of its Ends. This laſt Rope is that which " raiſes the Weight. At the other End of the Axel " there is a great wooden Wheel like a Pully H H, " about which is wound a long Rope N.

" To work this Engine, one muſt pull the long Rope " N, which cauſing the great Wheel to turn, does alſo " carry round the Axel or Barrel, which is made faſt " to it. This Axel, as it turns round, cauſes the " Ropes E E to wind about it, and thereby the Axel " and the Wheel riſe, whilſt the Rope F, to which " the Weight is faſten'd, does alſo wind itſelf up upon " the Axel the contrary Way; and this double wind- " ing up of the Ropes makes both the Burthen and " the Axel and Wheel to riſe at the ſame Time. Now " it is evident, that all this Riſe is perform'd without " the Friction of any Part, and conſequently, the whole " Power which draws the Rope N, is employ'd with- " out any Hindrance; which cannot be in other En- " gines.

" It may be objected that the Power which acts at " N, muſt, beſides the Weight, raiſe alſo the Axel and " great Wheel, and that their Weight is one of thoſe " Obſtacles which *Ariſtotle* ſays all Engines are lia- " ble to; and that this Obſtacle is equivalent to the " Friction which is in other Organs. But it may be " anſwer'd, That Friction is an Obſtacle wholly una- " voidable in all other Organs; but that it is eaſy to " remedy the Obſtacles of this, which is done by " Means of the heavy Body M, taken equal in Weight " to the great Wheel and Axel, which it ſuſtains by " Means of the Rope I I, which running over the " Pullies L L, is fix'd to the Ring or Collar K, that " goes round the Axel F. For the Axel and the

" Wheel

" Wheel being counterpois'd by this Weight, the Power " which acts by drawing the long Rope N, acts for " raiſing the Weight only. The Experiment which " was made with this Engine has confirm'd the Truth " of this Problem, by comparing its Effects with thoſe " of a Crane, in which the Proportion of the Bigneſs " of the Axel to the Circumference of the Wheel, " was the ſame as in my Machine: For it happen'd " that in the Crane, a Weight of One hanging at a " Rope going about the Wheel, drew up a Weight of " Seven, when it had one Half added to it to make it " preponderate, or give Motion to the Power: And " when the Weight to be rais'd, and the Weight which " ſerv'd as a Power, were proportionably encreas'd, " there was alſo a Neceſſity to encreaſe the additional " Weight, which made the Power preponderate, in the " ſame Proportion: So that as it was requir'd to add " one Half to the Power when the Weight was Seven; " the Addition to the Power became One for a Four- " teen Pound Weight, Two for a Twenty-eight Pound, " Four for a Fifty-ſix Pound, and ſo on; becauſe " the Reſiſtance from Friction encreaſes nearly in the " ſame Proportion that the Weights are encreas'd. " But this did not happen to my Engine, in which one " Quarter was always ſufficient for the Draught (or " to make the Power preponderate) not only when " the Weight was Seven, but alſo when it was Four- " teen Pound, Twenty-eight Pound, Fifty-ſix Pound, " *&c.* which evidently ſhews, that this Engine acts " without Friction."

Thus far Monſ. *Perault*. But however plauſible this Deſcription may appear, a little Attention will ſhew, that if this new Engine had no Friction, yet it is more

more inconvenient than an *Axis in Peritrochio* with the ſame Proportions; and likewiſe that it has more Friction than the ſame Machine in the common Uſe. A C E, (Fig. 2.) is a common *Axis in Peritrochio*, which has the Wheel A E five Times bigger in Diameter than the Axel; ſo that A C, the Radius of the Wheel (which is the Diſtance of the Power) is to C B the Radius of the Axel (the Diſtance of the Weight) as 5 to 1: Conſequently One (for Example one Ounce, as in our Experiment) will keep five in Æquilibrio. Now though the Friction of the Gudgeon at C is unavoidable, yet it may be diminiſh'd by diminiſhing the Diameter of the Gudgeon, provided it remains ſtrong enough to ſuſtain the Machine and its Burthen. Here one Penny-weight, or $\frac{1}{20}$ of the Power added to it, makes it preponderate, and give the Machine Motion with a due Velocity.

Now this very Engine made uſe of in Monſ. *Perault*'s Way, does ſo alter the Diſtances of the Weight and Power, that inſtead of One for our Power, we muſt have Two and a half to keep the very ſame Weight Five, in Æquilibrio, as may appear by a Sight of the third Figure, where, ſince in the Action of the Machine, when we pull the Rope P A, we make the Axel D B to wind itſelf up upon the Rope H D, it is evident that D is now become the Center of Motion, D B (the whole Thickneſs of the Axis) the Diſtance of the Weight = 2; and the Diſtance of the Power is reduc'd to A D = 4. So that if two Men, having been employ'd in the common Way to raiſe Weights equal to the Strength of ten Men, an Engineer ſhould alter the Manner of working, and fit up the *Axis in Peritrochio* in Monſ. *Perault*'s Way, inſtead of gaining

an

an Advantage, he muſt call in three more Men to perform the Work. If it be anſwer'd, that what is loſt in Strength, will be gain'd in Time, it may not only be ſaid, that one cannot always call in more Help on the ſudden, but that even then, tho' we ſhould not call this an Inconveniency, yet there will be ſtill more Friction in this than in the common Method; for the Roller or Axel will find a Difficulty to wind on the Ropes, becauſe they are not perfectly pliable, and the leſs ſo, the greater the Weight is that ſtretches them. This, together with the Friction of the Collar of the Rope of the Counterpoiſe to the Engine, makes the Hindrance greater than in the common Way. For it appears by Experiment, that when the Power is become equal to $2\frac{1}{2}$ to keep the Weight 5 in Æquilibrio, there muſt be added $\frac{1}{5}$ (here 4 Penny-weight) to put the Power in Motion.

And to ſhew that this Friction of the Ropes is not always the ſame as Monſ. *Perault* ſuppoſes it; when P (or the Power) is made only one Ounce, and W (or the Weight) two Ounces, then to make the Power preponderate, only 2 Penny-weight and 18 Grains was ſufficient. N. B. When P is $= 2\frac{1}{2}$, and W $= 5$, the additional Weight mark'd $\frac{1}{5}$ was 4 Penny-weight and 2 Grains.

It is plain from this, that Monſ. *Perault*'s Experiments were very inaccurately made, and therefore not to be depended upon.